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## **GUIDANCE ON SHIPBOARD TOWING AND MOORING EQUIPMENT**

1 The Maritime Safety Committee, at its eightieth session (11 to 20 May 2005), following the recommendations made by the Sub-Committee on Ship Design and Equipment at its forty-eighth session, approved guidance concerning shipboard equipment, fittings and supporting hull structures associated with towing and mooring, as set out in the annex, with a view to ensuring a uniform approach towards the application of the provisions of SOLAS regulation II-1/3-8, which is expected to become effective on 1 January 2007.

2 Member Governments are invited to use the annexed guidance when applying SOLAS regulation II-1/3-8, and to bring it to the attention of all parties concerned.

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## ANNEX

### SHIPBOARD EQUIPMENT, FITTINGS AND SUPPORTING HULL STRUCTURES ASSOCIATED WITH TOWING AND MOORING

#### 1 Application

1.1 Under regulation II-1/3-8 of the 1974 SOLAS Convention, as adopted by resolution MSC.194(80) in 2005, new displacement type ships, except high-speed craft and offshore units, shall be provided with arrangements, equipment and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associated with the normal operations of the ship. The arrangements, equipment and fittings shall meet the appropriate requirements of the Administration or an organization recognized by the Administration.

1.2 This circular is intended to provide standards for the design and construction of shipboard fittings and supporting hull structures associated with towing and mooring, which Administrations are recommended to implement. The provisions of this guidance do not require tow lines nor mandate standards for mooring lines onboard the ship.

1.3 Equipment that is used for both towing and mooring should be in accordance with sections 3 and 4.

#### 2 Definitions

For the purpose of this guidance:

2.1 *Shipboard fittings* mean bollards and bitts, fairleads, stand rollers and chocks used for the normal mooring of the ship and similar components used for the normal towing of the ship. Other components such as capstans, winches, etc. are not covered by this guidance. Any weld, bolt or other fastening connecting the shipboard fitting to the supporting hull structure is part of the shipboard fitting and subject to any industry standard applicable to such fitting.

2.2 *Supporting hull structure* means that part of the ship structure on/in which the shipboard fitting is placed and which is directly submitted to the forces exerted on the shipboard fitting. The hull structure supporting capstans, winches, etc. used for the normal towing and mooring operations mentioned above should also be subject to this guidance.

2.3 *Industry standard* means international or national standards which are recognized in the country where the ship is built, subject to the approval of the Administration.

#### 3 Towing fittings

##### 3.1 Strength

The strength of shipboard fittings used for normal towing operations and their supporting hull structures should comply with the provisions of 3.2 to 3.6.

### 3.2 Arrangements

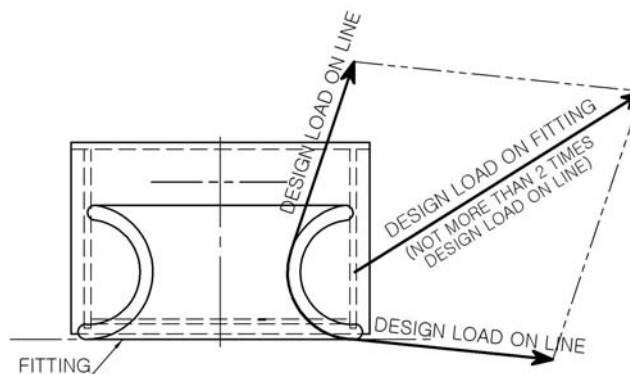
Shipboard fittings for towing should be located on longitudinals, beams and/or girders, which are part of the deck construction so as to facilitate efficient distribution of the towing load. Other equivalent arrangements may be accepted (for Panama chocks, etc.).

### 3.3 Load considerations

3.3.1 The design load used for normal towing operations (e.g. harbour/manoeuvring) should be 1.25 times the intended maximum towing load (e.g. static bollard pull) as indicated on the towing and mooring arrangements plan. The design load should be applied through the tow line according to the arrangement shown on the towing and mooring arrangements plan.

3.3.2 For other towage service (e.g. escort), the design load used for each fitting should be the nominal breaking strength of the tow line defined in table 1 based on the equipment number (EN) described in the appendix. The design load should be applied through the tow line according to the arrangement shown on the towing and mooring arrangements plan.

3.3.3 The method of application of the design load to the fittings and supporting hull structure should be taken into account such that the total load need not be more than twice the design load specified in 3.3.1 or 3.3.2, i.e. no more than one turn of one line (see figure below).



### 3.4 Shipboard fittings

The selection of shipboard fittings should be made by the shipyard in accordance with industry standards (e.g. ISO 3913:1977 Shipbuilding-Welded steel bollards) accepted by the Administration. When the shipboard fitting is not selected from an accepted industry standard, the design load used to assess its strength and its attachment to the ship should be in accordance with 3.3 above.

### 3.5 Supporting hull structure

#### *Arrangement*

3.5.1 The arrangement of the reinforced members (carling) beneath shipboard fittings should consider any variation of direction (laterally and vertically) of the towing forces (which should be not less than the design load as per 3.3) acting through the arrangement of connection to the shipboard fittings.

### *Acting point of towing force*

3.5.2 The acting point of the towing force on shipboard fittings should be taken at the attachment point of a towing line or at a change in its direction.

### *Allowable stresses*

3.5.3 Allowable bending stress: 100% of the specified yield point for the material used; allowable shearing stress: 60% of the specified yield point for the material used; no stress concentration factors being taken into account.

## **3.6 Safe working load (SWL)**

3.6.1 The SWL used for normal towing operations (harbour/manoeuvring) should not exceed 80% of the design load as given in 3.3.1 and the SWL used for other towing operations (e.g. escort) should not exceed the design load as given in 3.3.2. For fittings used for both harbour and escort purposes, the greater of the design loads of 3.3.1 and 3.3.2 should be used.

3.6.2 The SWL of each shipboard fitting should be marked (by weld bead or equivalent) on the deck fittings used for towing.

3.6.3 The above provisions on SWL apply for a single post basis (no more than one turn of one line).

3.6.4 The towing and mooring arrangements plan described in section 5 should define the method of use of towing lines.

## **4 Mooring fittings**

### **4.1 Strength**

The strength of shipboard fittings used for mooring operations and their supporting hull structures should comply with the provisions of 4.2 to 4.6.

### **4.2 Arrangements**

Shipboard fittings for mooring should be located on longitudinals, beams and/or girders, which are part of the deck construction so as to facilitate efficient distribution of the mooring load. Other equivalent arrangements may be accepted (for Panama chocks, etc.).

### **4.3 Load considerations**

4.3.1 The design load applied to shipboard fittings and supporting hull structures should be 1.25 times the breaking strength of the mooring line provided in accordance with table 1 based on the equipment number (EN) described in the appendix. The design load should be applied through the mooring line according to the arrangement shown on the towing and mooring arrangements plan.

4.3.2 The design load applied to supporting hull structures for winches, etc. should be 1.25 times the breaking strength of the mooring line according to 4.3.1 above and, for capstans, 1.25 times the maximum hauling-in force. The design load should be applied through the mooring line according to the arrangement shown on the towing and mooring arrangements plan.

4.3.3 The method of application of the design load to the fittings and supporting hull structure should be taken into account such that the total load need not be more than twice the design load specified in 4.3.1, i.e. no more than one turn of one line.

#### **4.4 Shipboard fittings**

The selection of shipboard fittings should be made by the shipyard in accordance with industry standards (e.g. ISO 3913:1977 Shipbuilding-Welded steel bollards) accepted by the Administration. When the shipboard fitting is not selected from an accepted industry standard, the fittings should be equivalent to a recognized industry standard in compliance with the design load as per 4.3.

#### **4.5 Supporting hull structure**

##### *Arrangement*

4.5.1 The arrangement of the reinforced members (carling) beneath shipboard fittings should consider any variation of direction (laterally and vertically) of the mooring forces (which should be not less than the design load given in 4.3) acting through the arrangement of connection to the shipboard fittings.

##### *Acting point of mooring force*

4.5.2 The acting point of the mooring force on shipboard fittings should be taken at the attachment point of a mooring line or at a change in its direction.

##### *Allowable stresses*

4.5.3 Allowable bending stress: 100% of the specified yield point for the material used; allowable shearing stress: 60% of the specified yield point for the material used; no stress concentration factors being taken into account.

#### **4.6 Safe working load (SWL)**

4.6.1 The SWL should not exceed 80% of the design load given in 4.3.

4.6.2 The SWL of each shipboard fitting should be marked (by weld bead or equivalent) on the deck fittings used for mooring.

4.6.3 The above provisions on SWL apply for a single post basis (no more than one turn of one line).

4.6.4 The towing and mooring arrangements plan described in section 5 should define the method of use of mooring lines.

## **5 Towing and mooring arrangements plan**

5.1 The SWL for the intended use for each shipboard fitting should be noted in the towing and mooring arrangements plan available on board for the guidance of the Master.

5.2 Information provided on the plan should include in respect of each shipboard fitting:

- .1 location on the ship;
- .2 fitting type;
- .3 SWL;
- .4 purpose (mooring/harbour towing/escort towing); and
- .5 method of applying load of towing or mooring line including limiting fleet angles.

**Table 1**  
**MOORING AND TOW LINES**

EQUIPMENT NUMBER		MOORING LINES	TOW LINE*
Exceeding	Not exceeding	Minimum breaking strength (kN)	Breaking strength (kN)
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
50	70	34	98
70	90	37	98
90	110	39	98
110	130	44	98
130	150	49	98
150	175	54	98
175	205	59	112
205	240	64	129
240	280	69	150
280	320	74	174
320	360	78	207
360	400	88	224
400	450	98	250
450	500	108	277
500	550	123	306
550	600	132	338
600	660	147	370
660	720	157	406
720	780	172	441
780	840	186	479
840	910	201	518
910	980	216	559
980	1060	230	603
1060	1140	250	647
1140	1220	270	691
1220	1300	284	738
1300	1390	309	786
1390	1480	324	836
1480	1570	324	888
1570	1670	333	941
1670	1790	353	1024
1790	1930	378	1109
1930	2080	402	1168
2080	2230	422	1259
2230	2380	451	1356
2380	2530	480	1453
2530	2700	480	1471
2700	2870	490	1471
2870	3040	500	1471
3040	3210	520	1471
3210	3400	554	1471



EQUIPMENT NUMBER		MOORING LINES	TOW LINE*
Exceeding	Not exceeding	Minimum breaking strength (kN)	Breaking strength (kN)
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
3400	3600	588	1471
3600	3800	618	1471
3800	4000	647	1471
4000	4200	647	1471
4200	4400	657	1471
4400	4600	667	1471
4600	4800	677	1471
4800	5000	686	1471
5000	5200	686	1471
5200	5500	696	1471
5500	5800	706	1471
5800	6100	706	1471
6100	6500	716	
6500	6900	726	
6900	7400	726	
7400	7900	726	
7900	8400	736	
8400	8900	736	
8900	9400	736	
9400	10000	736	
10000	10700	736	
10700	11500	736	
11500	12400	736	
12400	13400	736	
13400	14600	736	
14600	16000	736	

\* Information is provided in relation to 3.3.2 and provision onboard of such a line is not necessary under this guidance.

## APPENDIX

### EQUIPMENT NUMBER

The equipment number (EN) should be calculated as follows:

$$EN = \Delta^{2/3} + 2.0hB + \frac{A}{10}$$

where:

$\Delta$  = moulded displacement, in tonnes, to the Summer Load Waterline

B = moulded breadth, in metres

h = effective height, in metres, from the Summer Load Waterline to the top of the uppermost house; for the lowest tier "h" should be measured at centreline from the upper deck or from a notional deck line where there is local discontinuity in the upper deck

$$h = a + \sum h_i$$

where:

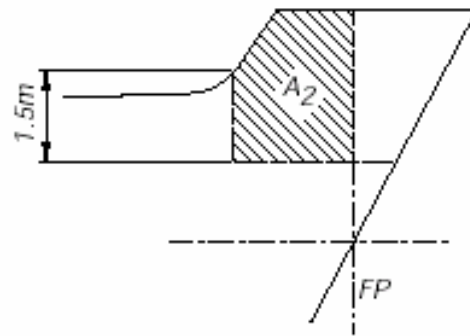
a = distance, in metres, from the Summer Load Waterline amidships to the upper deck

$h_i$  = height, in metres, on the centreline of each tier of houses having a breadth greater than B/4

A = area, in square metres, in profile view, of the hull, superstructures and houses above the Summer Load Waterline which are within the equipment length of the ship and also have a breadth greater than B/4

#### NOTES

- 1 When calculating h, sheer and trim should be ignored, i.e. h is the sum of freeboard amidships plus the height (at centreline) of each tier of houses having a breadth greater than B/4.
- 2 If a house having a breadth greater than B/4 is above a house with a breadth of B/4 or less, then the wide house should be included but the narrow house ignored.
- 3 Screens or bulwarks 1.5 m or more in height should be regarded as parts of houses when determining h and A. The height of the hatch coamings and that of any deck cargo, such as containers, may be disregarded when determining h and A. With regard to determining A, when a bulwark is more than 1.5 m high, the area shown below as  $A_2$  should be included in A.



- 4 The equipment length of the ships is the length between perpendiculars but should not be less than 96% nor greater than 97% of the extreme length on the Summer Waterline (measured from the forward end of the waterline).

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